

Commissioning - Expediting Laboratory Construction, *"On Time / On Budget"*



OVERVIEW

Scheduling of construction phase commissioning tasks within the Construction Master Schedule.

- **Commissioning Schedule:**
 - **Developed by the Commissioning Team and maintained by the CxA.**
 - **Coordinates commissioning tasks, activities by contractors and others.**
 - **intended to provide coordination information to the construction and validation schedules.**

Endeavors to fit into the construction schedule wherever possible to eliminate the duplication tasks and observations.

BASIS FOR SCHEDULING **COMMISSIONING**

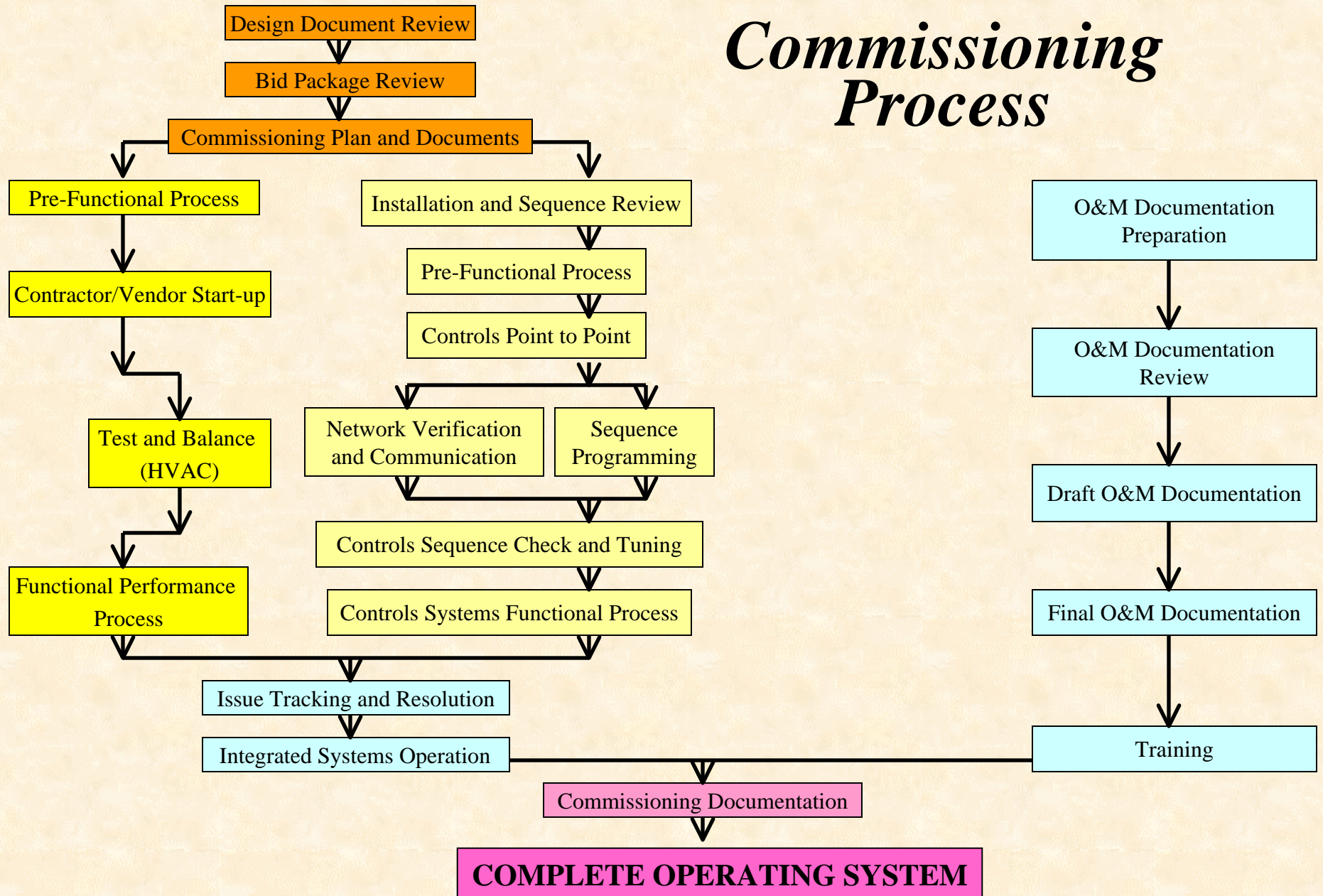
- **The Commissioning Processes**
 - **Pre-Functional**
 - **Testing**
 - **Start-up**
 - **Functional**
- **What is Commissioned**
- **What is Scheduled**
- **Define Procedures**

Challenge

How to move to Proactive/Positive Early In Project

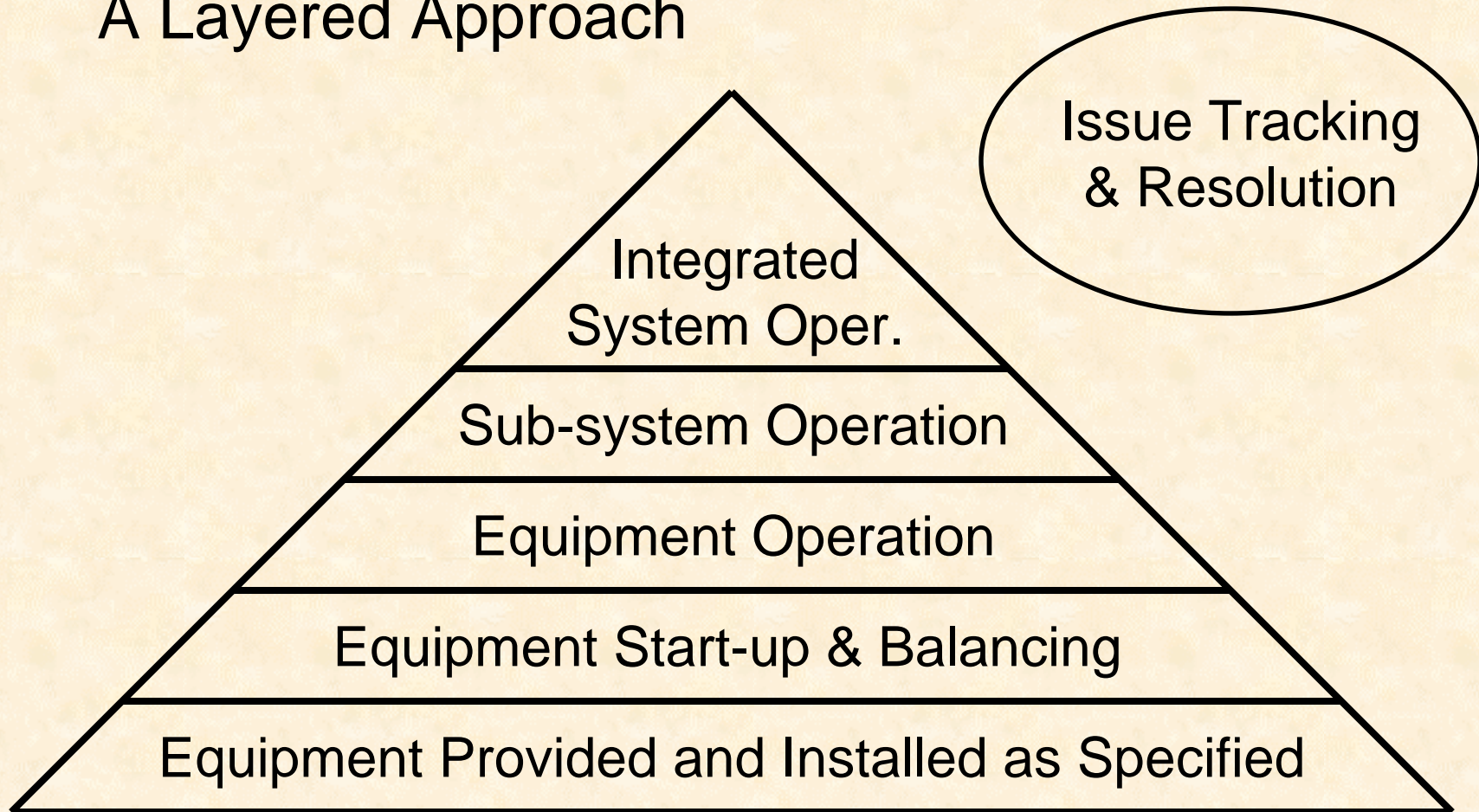
- **Positive buy-in**
- **Early buy-in**
- **Defined Benefits**

Commissioning Process



Commissioning Process Intent

A Layered Approach



What is Commissioned

Spec. Plumb sys

Potable cold water
distribution

Potable hot water
distribution

Sanitary waste dist

Wastewater ejector

HVAC Sys

HVAC heating hot water distribution

Pumps

Unit Heaters

Cabinet Heat

Fin Tube-Rad

Process chill

Elec Sys

Medium Voltage

Low Voltage

UPS

Electrical lighting

Lab sys

Clean steam distribution

Clean steam condensate

Purified water generation piping

Purified water distribution

Lab Vacuum generation

Controls & Mon. Sys

LEL Gas Monitoring

HCN detection system

BMS by E3

What is Scheduled

Pre-Functional Process

Contractor/Vendor Start-up

Controls Point to Point

Contractor/Vendor Testing

Controls Sequence Check and Tuning

Test and Balance (HVAC)

Controls Systems Functional Process

Functional Performance Process

Define Procedures

Pre-Functional

PRE-FUNCTIONAL PERFORMANCE CHECKLIST Water-Cooled Chillers		
Participants (name, company, phone):		Date:
Manufacturer: Trane		
Model: CVHF0640		
ITEM	OK	COMMENTS
Access space for service and maintenance of equip.		
Labeled per specification		
plumb and level (15685.3.2)		
pipng allow service & tube cleaning (15685.3.2)		
flexible pipe connections (15685.3.2)		
pipng from rupture disk to outdoors (15685.3.2)		
units clean (15685.3.3)		
scratches touched up (15685.3.3)		
Control Panel (15685.2.1)		
see control panel features in spec (15685..2.1.M.6)		
analog output of % RLA (for BAS connection)		
serial port communications device		
4 control valves per chiller (M5.2)		
Cu field supplied wires, bus bars, fittings (15685.2.2)		
Ammeters - 3, or 1 switchable (15685.2.2)		
Ammeters calibrated to read inrush current (15685.2.2)		
Voltmeters - 3, or 1 switchable (15685.2.2)		
self-contained breathing apparatus (15685.2.4)		
venturi flow meters on CHW and CDW (RFI #303)		
thermometers enter. & lvng. CDW & CHW (M6.4)		
pressure gauges (M6.4)		
P/T plugs (M6.4)		

Define Procedures

Start-up & Testing

START-UP FORM Pumps		
Participants (name, company, phone):		Date:
Job:		
Pump Manufacturer:		Pump Model:
Motor Manufacturer:		Motor Model:
Motor Name Plate Data:		
MHP/BHP:		
volts / #phases:		
FLA/LRA:		
SF/PF/eff.:		
UNIT OFF	lubricate motor	oil/grease type used
	lubricate bearings	oil/grease type used
	check wicking	
	inspect seals	
	inspect coupler	
	inspect motor mounts	
	inspect pump aliagment	

Start-up is performed by the vendor or the contractors designated start-up personnel, who will fill out appropriate start-up documentation. This assures that ALL equipment has been checked and is ready to be operated as needed for T&B and Functional checkout. This includes but is not limited to: volts & amps on all 3 phases, bearing temperatures.

Test & Balance

At this point systems are fully balanced, operational and ready for Functional Performance Checkout.

Define Procedures

Functional

FUNCTIONAL PERFORMANCE CHECKLIST Water-Cooled Chiller - Operation		
Participants (name, company, phone):		Date:
Manufacturer:		System Information:
Installing contractor:		
Installing technicians:		
ITEM	OK/Value	COMMENTS
With single chiller running		
Safeties/Alarms		
low CHWT		
low evaporator refrigerant temp.		
high condenser refrigerant pressure		
evap. and cond. water flow status via delta P switches		
low oil pressure		
low oil temperature		
high oil temperature		
high motor winding temperatures		
sensor faults		
high compressor motor bearing temperature		
motor protection		
Control Panel Readouts		
ent. and lvng. evap. water temp.		
ent. and lvng. cond. water temp.		
compressor motor winding temp.		
saturated evap. & cond. refrigerant temp.		
evap. and cond. refrigerant pressure		
purge compressor suction temp.		
oil temp.		
oil tank pressure		

IDENTIFY PREDECESSORS

PRIORITY	SYSTEM/ PREREQ.	TOP #	COMPLETION NOTES	PREDECESSORS	Responsible Party	Start date	Total Duration
1	COMPRESSED AIR	100					
			PREDECESSORS:				
				Plant Compressed Air	Owner		
		100	ACP Receivers, Tanks & Accessories				
		1	Prefunctional		Mech Contr	9/1/02	
		2	Start-up		Mech Contr		5
		3	Functional		Mech Contr		1
		100	ACP Piping to Instrument Air				
		1	Prefunctional		Mech Contr	9/1/02	
		2	Blow Down		Mech Contr		5
		3	Functional		Mech Contr		1
		100	ACP Piping to Building & UTS Panels				
		1	Prefunctional		Mech Contr		
		2	Blow Down		Mech Contr		5
		3	Functional		Mech Contr		1

Equipment Start-up & Balancing

- **By Vendor / Contractor**
- **CC oversees, collects doc's.**
- **Verifies equipment operable for TAB and functional Cx.**



IDENTIFY TASKS PER SYSTEM

rev. 9/12/02

by: JD - E3

Elec. C

Mech

Controls

sub-system	locations	status	target date	Not
Pneumatics				
Prefunctional		100%	8/28/02	
Piped to actuators and Fire Dampers		100%	9/10/02	
Supply Duct & Accessories- 1st Flr.				
Prefunctional		90%	9/20/02	
JCI panel in place				
120V to JCI Pnl 1& 4, PWR 1, 2, 5, 8 & 9			9/13/02	
Fire/smoke dampers held open			9/13/02	
Supply Duct & Accessories- 2nd Flr.				
Prefunctional		60%	9/27/02	
Fire/smoke dampers held open			10/25/02	
JCI panel in place				
120V to JCI Pnl 5, 6 & 11 PWR 3, 4, 6, 7, 10			10/25/02	
Supply Air Duct & Plenums (PH)				
Prefunctional		60%	10/25/02	
AHU-1 thru 4				
Prefunctional		50%	9/27/02	
Filters provided / installed			9/27/02	
480V Pwr To AHU VFD from PNM401			9/13/02	
JCI panel in place				
120V (3 cir.) to JCI Pnl 8 & AHU Pnl			9/13/02	
Fire/smoke dampers held open			9/13/02	
Actuators piped to open			9/13/02	
Start-up AHU / VFD			9/30 - 10/9/02	
Exhaust Duct & Acc.- Penthouse				
Prefunctional		50%	9/27/02	
Exhaust Duct & Accessories- 1st Flr.				
Prefunctional		50%	9/27/02	

Equipment Operation

- Check equipment for basic operation
- Verify equipment capacity, energy efficiency, motor amps & volts, etc.



IDENTIFY LINKS & DURATIONS

ID	Sys PreReq	Respn. Part	Start	Finish	August						September				October			
					21	28	4	11	18	25	1	8	15	22	29	6	13	20
1	Proj Name		7/1/02	2/4/03														
2	COMPRESSED AIR		8/1/02	10/7/02														
3	<i>Compressed Air from Plant</i>	<i>Amgen</i>	<i>8/5/02</i>	<i>8/5/02</i>														
4	ACP Receivers, Tanks & Accessories		8/1/02	9/6/02														
5	Prefunctional	Murphy	8/1/02	8/28/02														
6	Start-up	Murphy	9/2/02	9/6/02														
7	ACP Piping to Instrument Air		8/1/02	9/6/02														
8	Prefunctional	Murphy	8/1/02	8/28/02														
9	Blow Down	Murphy	9/2/02	9/6/02														
10	ACP Piping to Building & UTS Panels		9/10/02	10/7/02														
11	Prefunctional	Murphy	9/10/02	9/30/02														
12	Blow Down	Murphy	10/1/02	10/7/02														
13	Central Air Supply - AHU (dryside), Supply Air I	Skidmore[7]	9/13/02	1/29/03														
14	Air Handling Unit -AHU-1 - 4 (Dryside)		9/13/02	1/29/03														
15	Prefunctional	All	9/13/02	9/13/02														
20	Start-up AHU / VFD	Murphy	9/30/02	9/30/02														
22	Sequence Checkout (CHWS/HWS/H	JCI	9/29/02	10/11/02														
23	T&B	TAB	10/7/02	10/18/02														
24	Functional (SAT)	JCI/E Cube	1/20/03	1/29/03														
25	Central Air Supply - Duct & Acc. (dryside) AHUs		9/2/02	1/24/03														
26	Supply Duct & Accessories- 1st Flr.		9/13/02	1/23/03														

Summary

Process, Schedule & Deadlines

- Focus on Critical & Complex Systems



Benefits

- **Improved Construction Schedules**
- **Fewer Change Requests**
- **Deadlines met or exceeded**
- **Reduced Warranty & Follow-up**

